RHODORA, Vol. 106, No. 926, pp. 192–195, 2004

NEBC MEETING NEWS

January 2004. The night's meeting, being the "Fourth Foray into Food and Flowers," began with a potluck dinner featuring many dishes with a botanical theme. Some of the notable contributions this year included pickled *Salicornia* (glasswort), vegetarian chili, and other spicy dishes to warm us up on a bitterly cold night. There were also several desserts featuring the ever-popular *Theobroma cacao* (chocolate). Once members could tear themselves away from the food, they perused books and other items for sale, or bought tickets for the raffle of botanical books.

Following the feast, members settled into their chairs for a night of "show and tell." Each person was allowed ten slides, or ten minutes, to show the club interesting botanical exploits from the past year. Don Lubin started the night with a digital slide show of pteridophytes (ferns and fern allies), including species from Bermuda and Mt. Washington. Members who wanted a closer look were invited to visit Don's website [http://www.theworld.com/~donlubin].

The "true" slide show then began, with President Paul Somers showing photos of the Southern Appalachians, a thinly veiled plot to encourage members to sign up for the club trip to that region this May. Bryan Hamlin was next with brilliant macro shots of orchid species and *Gaultheria hispidula* (creeping snowberry). George Newman followed with his photos from Burnt Cape. This ecological reserve in Newfoundland, visited by Fernald, featured the dwarf-like willow species *Salix uva-ursi* (bearberry willow) and *Salix vestita* (rock willow). Alice Schori then presented her slides of NEBC members in the act of botanizing at several New England locations. She was followed by Marsha Salett, whose slides of Cape Cod, from her recent photography exhibition "From Bogs to Beaches," brought many "oohs" and "aahs" from the crowd.

Following Marsha, it was back to the computers. After Bryan snuck in a few more photos of ericads from his digital collection, Corresponding Secretary Nancy Eyster-Smith tapped into her own huge digital image collection, wowing the audience with a photo of a rest-stop *Pimpinella anisum* plant (anise), from her family trip to Florida. The "show and tell" ended with Jennifer Forman Orth's images of "botanical oddities," including a variegated *Celastrus orbiculatus* (Asiatic bittersweet) and the invasive orchid *Epipactis helleborine* (broad-leaved helleborine). When the lights came back up, members retired to the refreshments room to hear the winning numbers for the book raffle, and perhaps for a second helping of dessert.

March 2004. Les Mehrhoff introduced the night's speaker, Dr. Bernard Goffinet from the University of Connecticut. His talk was entitled "When a phenotype belongs to multiple genotypes: Phylogenetic affinities of North American species in the lichen genus *Dendriscocaulon*." Lichens are a symbiotic association between a fungus (the mycobiont) and populations of unicellular or filamentous algae or cyanobacteria (the photobiont). This association tends to be stable, and also obligatory for the fungus, while some species of photobionts can be free-living. Dr. Goffinet compared the fungus-algae association to that of an agricultural system, with the fungus depending on the output of the algal "crops." The morphology of fungus species that lichenize is very different when the fungus is grown alone in culture and resembles callus tissue.

There has been much research focused on species specificity in lichen relationships. Some fungus species have a high degree of specificity, such as *Diploschistes muscorum*, which will appropriate *Trebouxia showmanii*, the photobiont of the lichen *Cladonia*, to establish independent thalli. Yet in some cases, two or more species of algae have been isolated from a single lichen, indicating that if there is specificity, it is not narrow. Researchers in Finland coined the term "lichen guilds" to refer to groups of fungi that share related photobionts. For example, many epiphytic lichens form a guild that shares the same cyanobacterial strain. The photobionts differ from those of terrestrial lichens, even when the mycobionts of the epiphytic and terrestrial lichens are congeners.

About 90% of lichens are associations between fungi and green algae, while 10% are fungi and cyanobacteria (blue-green algae). Some fungi have a primary association with a green alga as well as internal or external warts of cyanobacterial colonies known as cephalodia. These tripartite relationships can change, as occurs with *Peltigera leucophlebia*, which first adopts cyanobacteria following reproduction via fungal spores, then forms a macrothallus with green algae, and finally forms cephalodia. *Sticta felix* lichenizes with cyanobacteria in some locations, but forms a morph with green algae in drier, high-light habitats. Recent molecular research has revealed several cases where what appeared to be two different lichen species were actually the same fungus associating with two different photobionts. *Lobaria amplissima*, for example, forms a foliose (flat) lichen when associating with a green alga, and a fruticose (branched, treelike) lichen with a cyanobacterium. The lichen once identified as *Nephroma silvae-veteris* was discovered through molecular and chemical testing to be a foliose cyanomorph of *Lobaria oregana*.

Bernard then spoke about his research, asking the question: have the many fungi that lichenize into "Dendriscocauloid" growth forms (lichens in the genus *Dendriscocaulon*) evolved from a single ancestor, or do they represent a polyphyletic group? In North America two species of *Dendriscocaulon* have been identified. These species likely represent cyanomorphs of lichens involving a green alga. The question is, which species? Using the ribosomal DNA sequences of the ITS, he compared 110 lichen samples (about 25 haplotypes) assigned to several different genera. When the sequences were aligned, there were some conserved regions, but also significant amounts of variation. Looking at only the conserved regions of the DNA, he could separate the samples of North American *Dendriscocaulon* into at least four fungal lineages, indicating that these *Dendriscocaulon* thalli share their fungus with either 1) *Sticta wrightii*, 2) *Lobaria quercizans*, 3) *L. amplissima*, or 4) some yet unidentified lineage.

Dr. Goffinet then turned to an examination of the photobiont genus *Nostoc*, a strain of cyanobacteria. Only one strain of *Nostoc* is found per lichen, with some fungus species like *Peltigera aphthosa* exhibiting a high degree of specificity. The *Nostoc* found in the cephalodia of a lichen formed with green algae is different from that found in a free-living cyanomorph (simple fungus-cyanobacteria association). Sequencing of *Nostoc* of Dendriscocauloid lichens has yet to show a taxonomic or geographic pattern.

April 2004. Vice President Karen Searcy introduced the night's speaker: Julie Dragon, a Ph.D. candidate at the University of Vermont. Julie, who received the club's Graduate Student Award in 2003, spoke about "*Carex lenticularis* and its allies: Phylogeny, biogeography, and species delimitation."

Carex is a cosmopolitan genus of approximately 2500 species of sedges. When Julie first became interested in the genus, she spoke with Lisa Standley, past NEBC President and resident *Carex* expert. Lisa recommended exploring the *C. acuta* complex, 12 species in section *Phacocystis*, with a chromosome range of 42 to 46. For her Master's thesis, Julie investigated the cohesiveness of the *C. acuta* complex and its possible sister complexes. She began by collecting samples of all of the species in the complex, along with other species in section *Phacocystis*, and some from sections with a putative sister affiliation. The species she collected came from many locations, including Vermont (*C. lenticularis*) and Quebec (*C. paleacea*). She also received samples from places as diverse as Washington state (*C. lenticularis* var. *lipocarpa*), Iceland (*C. nigra*, *C. rufina*, *C. bicolor*), Argentina (*C. decidua*), and Denmark (*C. trinervis*).

Julie sequenced DNA from each sample, focusing on two ribosomal DNA spacers: ITS and ETS. With strict consensus of two parsimonious trees, she found that *Carex torta*, *C. gynandra*, and *C. crinita* were separated from the rest of the taxa by *C. podocarpa* of section *Scitae*, indicating that section *Phacocystis* is polyphyletic. The data further revealed that the *C. acuta* complex was not a natural complex, but rather consisted of two groups, with major taxa between them. Further support for the clades identified by the data included geographic cohesiveness, with species grouping according to their native ranges: Eurasia, Austral Asia, and America.

For her Ph.D. research, Julie is looking more closely at the American clade, which includes *Carex lenticularis* and its allies, and *C. aquatilis*. While *C. aquatilis* is monophyletic, *C. lenticularis* is not, with its western varieties sister to *C. aquatilis* and its eastern varieties sister to the amphi-Atlantic *C. rufina* and South American *C. decidua*. She has completed additional sampling within the clade and will be adding chloroplast DNA sequences to the molecular analysis. Sedges from Mexico (*C. hermannii*), the western U.S. (*C. lenticularis* var. *dolia* and var. *impressa*), and Alaska (*C. utriculata*, *C. microchaeta*, and *C. mertensii*) were collected for this portion of her research. Julie noted that during her field season in Alaska, her most remarkable find may have been *C. lenticularis* var. *dolia*, a rare species she happened upon along a roadside.

Julie then constructed a new phylogenetic tree that included the new samples from Alaska along with the rest of the American clade and outgroup taxa. Preliminary analysis indicates that the Alaskan species *Carex spectabilis* and *C. podocarpa*, which are placed together in section *Scitae*, are part of a single clade. However, another member of the same section, *C. microchaeta*, is sister to *C. aquatilis*. While much of the topology of the tree remains the same, samples of *C. lenticularis* var. *dolia* (Montana) and *C. eleusinoides* (Siberia) remain part of an Austral-East Asian clade, separate from the same taxa and other varieties of *C. lenticularis* in the American clade. Samples of *Carex bigelowii*, collected from both Alaska and Vermont, formed a clade, but were separated by *C. scopulorum*, a species native to the northwestern U.S. Her future research will include using the molecular phylogeny to reexamine the morphology of the *C. lenticularis* group, determining what morphological characteristics reflect the evolutionary history of the clade, and revising the taxonomy as necessary.

—Jennifer Forman Orth, Recording Secretary.